



Available online at <http://jess.esrae.ru/>

“Journal of Economics and Social Sciences”



Green energy in the service of mankind

Tomsk Polytechnic University

Anton Pochufarov ^a

^aTomsk Polytechnic University

Abstract

This paper presents the project called “Vetrosvet” that has been carried out in Tomsk region by students of Tomsk Polytechnic University. This project has a great value as it is focused on popularizing green energy and renewable sources in Russia and, mainly, in the Tomsk region. Tomsk region is known as a center of innovation technology. That is why the region has been chosen for carrying out the project. Moreover, the usage of wind turbines is more effective than solar panels in this region. It can be explained by the small amount of sunny days in Siberian region. The wind turbines are put together in the development laboratory at Tomsk Polytechnic University. The results of this project are presented in this paper.

Keywords: Green energy, renewable sources, student project;

1. Introduction

The modern world is faced with the problems of energy consumption: the exponential growth of the world population does not correspond to the increase in generating capacity, easily accessible oil sources will be exhausted in the short term, and the existing infrastructure in Russia has to use traditional energy sources. It seems obvious that there is a need to develop sustainable, inexhaustible energy sources. Sustainable, inexhaustible energy sources are sources such as wind, solar, geothermal resources of our planet. Solar energy is the solar radiation which, with the help of special devices, solar cells, is converted in electric. As for wind energy, wind force is converted by special turbines into electrical, mechanical, thermal or any other form of energy for use. Wind energy is a rapidly growing industry. The most complex and rare type of renewable energy is geothermal energy. This energy industry uses the energy contained in the bowels of the earth, by geothermal stations. But this technology is only developing. The task for developing inexhaustible sources of energy is realizable, but a sufficient number of competing companies of different sizes and different spheres of activity must provide the market for raw materials: equipment installation, its maintenance and repair, etc. What are the preventions for establishing this task in Russia? Firstly, it can be explained by the lack of skilled engineering staff, the people who would realize the idea of "clean future", create and develop technology. [2]

2. Project idea

In recent years there has been a significant expansion of private dwellings. However, the infrastructure is underdeveloped in these areas and people have problems with lightning, heating. This problem makes us think about new technologies for improving humans' lives. Thus, we decided to use the wind turbines to solve this problem. The project is carried out in the village called Prosorniy. It has more than 1000 residents and 200 of them are children of preschool and primary school age. In the center of the village there is a playground. There is no lighting, thus, it is impossible to use it in the evening, especially in winter when it gets dark at 5 p.m. The budget can't afford to install lights and connect them to the power transmission line.

This project has the goal to attract attention to energy efficiency resources that can solve the problem of lighting at the playgrounds and outdoor play areas.

To achieve this goal the following tasks are set:

- To analyze the area: to find the most efficient way to generate electricity; to identify technical and regulatory requirements for the designed lighting system;
- To design the turbine using available sources of information (based on technical papers and consultations with experts);
- To determine the list of necessary materials and to make an estimation of work;
- To make settlements of accounts, to deliver materials;
- To assemble a prototype to test the model in the field;
- To install the system. To test the mechanism;
- To provide feedback to determine the effectiveness of the system.

Having analyzed the area it is decided to use wind power generators. Two types of wind turbines are selected for comparative analysis. These are a horizontal vane wind turbine and wind generator of Ugrinsky. The idea of the system is simple: the wind turns the blades, the generator converts mechanical energy into electrical energy and through the brush-collector mechanism it is transmitted to the battery, and then, through the light barrier - to light bulbs. During a day, the battery accumulates energy sufficient for 4-5 hours of continuous lightning. To ensure proper illumination, it is decided to design, assemble and install four apparatus (three horizontal vane wind turbines and one wind generator of Ugrinsky).[1]

3. Project results

The project is designed to manufacture and install four wind turbines. The playground is equipped with an autonomous lighting system with wind turbines "Vetrosvet" and children have the opportunity to play in evenings.

It is shown that the use of wind generator of Ugrinsky is more preferable in the territories with constant winds with low wind velocity (1-1.5 m / s); vane wind turbines are effective in territories with higher velocity (2-2, 5 m / s). For the second wind turbine type the preferred profile of the blade, the dependence of the optimal number of blades from the average power of the wind flow are determined.

The result clearly shows an example of eco-friendly resource-efficient technologies usage for solving socially significant problems.

References

1. Labeish, V.G. (2003). Alternatives & Renewables [Netraditsionnyye i vozobnovlyayemyye istochniki energii]. St. Petersburg: SZTU.
2. Rakina, A.A, Ugay, E.V. (2015). Autonomous lighting system with wind turbine. [Sistema avtonomnogo osveshcheniya s ispol'zovaniyem vetrogeneratora «Vetrosvet»].

Resursoeffektivnym tekhnologiyam – energiyu i entuziazm molodykh. Tomsk: TPU. pp. 126-130.